

Amendments to the Claims:

Claims 1-4 (Canceled).

AW.
1/12/05
Claim 5 (Currently Amended): A movement vector generating apparatus for generating a movement vector for a movement compensation by means of an inter-frame prediction, when encoding a ~~pres~~et image information including an image of a plurality of frames by using the movement compensation, said apparatus comprising:

a plurality of generating devices each for generating ~~a the~~ movement vector corresponding to a search range and a search accuracy between one frame and another frame, for each pixel block which is located within said one frame respectively in the image information and includes a plurality of pixels, said generating devices respectively using search ranges different from each other and search accuracies different from each other; and

a selecting device for selecting one of the movement vectors generated by said generating devices, in accordance with characteristics of the image in said each pixel block, and then outputting the selected movement vector corresponding to said each pixel block,

wherein said generating devices comprise:

a first generator for generating a first movement vector, with a preset first range as the search range; and

a second generator for generating a second movement vector at ~~a the~~ search accuracy lower than that of the first movement vector, with a preset second range wider than the first range as the search range, and

wherein said selecting device comprises:

a first adding device for adding together absolute values of differences between a respective one of the pixels in the pixel block and its corresponding pixel in the frame targeted by the movement compensation, ~~as~~ for all of the pixels in the pixel block, in said first generator ~~generating device~~, to generate a first absolute value sum;

a second adding device for adding together absolute values of differences between a respective one of the pixels in the pixel block and its corresponding pixel in the frame targeted

by the movement compensation, as for all of the pixels in the pixel block, in said second generator generating device, to generate a second absolute value sum; and
a standardizing device for standardizing the generated first and second absolute value sums, respectively,

said selecting device comparing the standardized first absolute value sum with the standardized second absolute value sum, outputting the first movement vector as the selected movement vector if a difference between the standardized first absolute value sum and the standardized second absolute value sum is not greater than a predetermined threshold which is set in advance to detect a difference between the first movement vector and the second movement vector at a high accuracy, and outputting the second movement vector as the selected movement vector if the difference between the standardized first absolute value sum and the standardized second absolute value sum is greater than the predetermined threshold.

Claims 6-11 (Canceled).

12. (Currently Amended): A movement vector generating method of generating a movement vector for a movement compensation by means of an inter-frame prediction, when encoding a ~~preset~~ image information including an image of a plurality of frames by using the movement compensation, said method comprising:

a plurality of generating processes each for generating a ~~the~~ movement vector corresponding to a search range and a search accuracy between one frame and another frame, for each pixel block which is located within said one frame respectively in the image information and includes a plurality of pixels, said generating processes respectively using search ranges different from each other and search accuracies different from each other; and

a selecting process of selecting one of the movement vectors generated by the generating processes, in accordance with characteristics of the image in said each pixel block, and then outputting the selected movement vector corresponding to said each pixel block,

wherein said generating processes comprise:

a first generating process of generating a first movement vector, with a preset first range as the search range; and

a second generating process of generating a second movement vector at a the search accuracy lower than that of the first movement vector, with a preset second range wider than the first range as the search range, and

wherein said selecting process comprises:

a first adding process of adding together absolute values of differences between a respective one of the pixels in the pixel block and its corresponding pixel in the frame targeted by the movement compensation, ~~as~~ for all of the pixels in the pixel block, in said first generating process ~~device~~, to generate a first absolute value sum;

a second adding process of adding together absolute values of differences between a respective one of the pixels in the pixel block and its corresponding pixel in the frame targeted by the movement compensation, ~~as~~ for all of the pixels in the pixel block, in said second generating process ~~device~~, to generate a second absolute value sum; and

a standardizing process of standardizing the generated first and second absolute value sums, respectively,

said selecting process comparing the standardized first absolute value sum with the standardized second absolute value sum, outputting the first movement vector as the selected movement vector if a difference between the standardized first absolute value sum and the standardized second absolute value sum is not greater than a predetermined threshold which is set in advance to detect a difference between the first movement vector and the second movement vector at a high accuracy, and outputting the second movement vector as the selected movement vector if the difference between the standardized first absolute value sum and the standardized second absolute value sum is greater than the predetermined threshold.

Claim 13 (Canceled).

Claim 14 (Currently Amended): An image encoding method comprising

(a) a movement vector generating method of generating a movement vector for a movement compensation by means of an inter-frame prediction, when encoding ~~a~~ ~~pres~~et image information including an image of a plurality of frames by using the movement compensation, said method comprising:

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a plurality of generating processes each of generating the movement vector corresponding to a search range and a search accuracy between one frame and another frame, for each pixel block which is located within said one frame respectively in the image information and includes a plurality of pixels, said generating processes respectively using search ranges different from each other and search accuracies different from each other; and

a selecting process of selecting one of the movement vectors generated by the generating processes, in accordance with characteristics of the image in said each pixel block, and then outputting the selected movement vector corresponding to said each pixel block,

(b) a compensating process of performing the movement compensation on the basis of the selected movement vector outputted from the selecting process, to output a compensation signal, and

(c) an encoding process of encoding the image information on the basis of the compensation signal,

wherein the generating processes comprise:

a first generating process for generating a first movement vector using a first range as the search range; and

a second generating process for generating a second movement vector using a search accuracy different than that of the first movement vector and using a second range different than the first range as the search range, and

wherein the selecting process comprises:

a first adding process for adding together absolute values of differences between respective ones of the pixels in the pixel block and corresponding pixels in the frame targeted by movement compensation to generate a first absolute value sum, the differences added by the first adding process being calculated when the first movement vector is generated;

a second adding process for adding together absolute values of differences between respective ones of the pixels in the pixel block and corresponding pixels in the frame targeted by the movement compensation to generate a second absolute value sum, the differences added by the second adding process being calculated when the second movement vector is generated; and

a standardizing process of standardizing the generated first and second absolute value sums, respectively,

the selecting process comparing the standardized first absolute value sum with the standardized second absolute value sum, outputting the first movement vector as the selected movement vector if a difference between the standardized first absolute value sum and the standardized second absolute value sum is not greater than a specified threshold, and outputting the second movement vector as the selected movement vector if the difference between the standardized first absolute value sum and the standardized second absolute value sum is greater than the specified threshold.

pmw
1/12/05
Claim 15 (Currently Amended): A movement vector generating apparatus for an image encoding system, comprising:

two or more vector generators each of which generates a movement vector indicative of movement of a pixel block from one frame to another, the vector generators having different search ranges and accuracies; and

a selecting device for selecting, based on image characteristics of the pixel block, one of the movement vectors generated by the vector generators for use in a movement compensating process of the image encoding system,

wherein the two or more vector generators comprise:

a first vector generator for generating a first movement vector using a first search range and a first search accuracy; and

a second vector generator for generating a second movement vector using a second search range and a second search accuracy, and

wherein the selecting device comprises:

a first adding device for adding together absolute values of differences between respective ones of the pixels of the pixel block of the one frame and corresponding pixels of the other frame to generate a first absolute value sum, the differences added by the first adding device being calculated when the first movement vector is generated;

a second adding device for adding together absolute values of differences between respective ones of the pixels of the pixel block of the one frame and corresponding pixels of the other frame to generate a second absolute value sum, the differences added by the second adding device being calculated when the second movement vector is generated; and

a standardizing device for standardizing the generated first and second absolute value sums,

the selecting device comparing the standardized first absolute value sum with the standardized second absolute value sum, outputting the first movement vector as the selected movement vector if a difference between the standardized first absolute value sum and the standardized second absolute value sum is not greater than a specified threshold, and outputting the second movement vector as the selected movement vector if the difference between the standardized first absolute value sum and the standardized second absolute value sum is greater than the specified threshold.

Claims 16-18 (Canceled).

Claim 19 (Previously Presented): A movement vector generating apparatus according to Claim 15, comprising three or more vector generators.

Claim 20 (Currently Amended): A movement vector generating process for an image encoding system, comprising:

two or more vector generating processes each of which generates a movement vector indicative of movement of a pixel block from one frame to another, the vector generating processes having different search ranges and accuracies; and

a selecting process for selecting, based on image characteristics of the pixel block, one of the movement vectors generated by the vector generating processes for use in a movement compensating process of the image encoding system,

wherein the two or more vector generating processes comprise:

a first vector generating process for generating a first movement vector using a first search range and a first search accuracy; and

a second vector generating process for generating a second movement vector using a second search range and a second search accuracy, and

wherein the selecting process comprises:

a first adding process for adding together absolute values of differences between respective ones of the pixels of the pixel block of the one frame and corresponding pixels of the other frame to generate a first absolute value sum, the differences added by the first adding process being calculated when the first movement vector is generated;

a second adding process for adding together absolute values of differences between respective ones of the pixels of the pixel block of the one frame and corresponding pixels of the other frame to generate a second absolute value sum, the differences added by the second adding process being calculated when the second movement vector is generated; and

a standardizing process for standardizing the generated first and second absolute value sums,

the selecting process comparing the standardized first absolute value sum with the standardized second absolute value sum, outputting the first movement vector as the selected movement vector if a difference between the standardized first absolute value sum and the standardized second absolute value sum is not greater than a specified threshold, and outputting the second movement vector as the selected movement vector if the difference between the standardized first absolute value sum and the standardized second absolute value sum is greater than the specified threshold.

Claims 21-23 (Canceled).

Claim 24 (Previously Presented): A movement vector generating process according to Claim 20, comprising three or more vector generating processes.

Claim 25 (Currently Amended): A movement vector generating apparatus for generating a movement vector for use in a movement compensating process of an image encoding system, comprising:

two or more movement vector generators each of which uses different search criteria to generate a respective movement vector indicative of movement of the same pixel block from one frame to another; and

a selecting device for selecting, based on image characteristics of the pixel block, one of the movement vectors generated by the movement vector generators and outputting only the selected movement vector for use in the movement compensating process of the image encoding system,

wherein the two or more movement vector generators comprise:

a first movement vector generator for generating a first movement vector using first search criteria; and

a second movement vector generator for generating a second movement vector using second search criteria, and

wherein the selecting device comprises:

a first adding device for adding together absolute values of differences between respective ones of the pixels of the pixel block of the one frame and corresponding pixels of the other frame to generate a first absolute value sum, the differences added by the first adding device being calculated when the first movement vector is generated;

a second adding device for adding together absolute values of differences between respective ones of the pixels of the pixel block of the one frame and corresponding pixels of the other frame to generate a second absolute value sum, the differences added by the second adding device being calculated when the second movement vector is generated; and

a standardizing device for standardizing the generated first and second absolute value sums,

the selecting device comparing the standardized first absolute value sum with the standardized second absolute value sum, outputting the first movement vector as the selected movement vector if a difference between the standardized first absolute value sum and the standardized second absolute value sum is not greater than a specified threshold, and outputting the second movement vector as the selected movement vector if the difference between the standardized first absolute value sum and the standardized second absolute value sum is greater than the specified threshold.

Claims 26-28 (Canceled).

Claim 29 (Previously Presented): A movement vector generating apparatus according to Claim 25, comprising three or more movement vector generators.

Claim 30 (Currently Amended): A movement vector generating process for generating a movement vector for use in a movement compensating process of an image encoding system, comprising:

two or more movement vector generating processes each of which uses different search criteria to generate a respective movement vector indicative of movement of the same pixel block from one frame to another; and

a selecting process for selecting, based on image characteristics of the pixel block, one of the movement vectors generated by the movement vector generating processes and outputting only the selected movement vector for use in the movement compensating process of the image encoding system,

wherein the two or more movement vector generating processes comprise:

a first movement vector generating process for generating a first movement vector using first search criteria; and

a second movement vector generating process for generating a second movement vector using second search criteria, and

wherein the selecting process comprises:

a first adding process for adding together absolute values of differences between respective ones of the pixels of the pixel block of the one frame and corresponding pixels of the other frame to generate a first absolute value sum, the differences added by the first adding process being calculated when the first movement vector is generated;

a second adding process for adding together absolute values of differences between respective ones of the pixels of the pixel block of the one frame and corresponding pixels of the other frame to generate a second absolute value sum, the differences added by the second adding process being calculated when the second movement vector is generated; and

a standardizing process for standardizing the generated first and second absolute value sums,

the selecting process comparing the standardized first absolute value sum with the standardized second absolute value sum, outputting the first movement vector as the selected movement vector if a difference between the standardized first absolute value sum and the standardized second absolute value sum is not greater than a specified threshold, and outputting the second movement vector as the selected movement vector if the difference between the standardized first absolute value sum and the standardized second absolute value sum is greater than the specified threshold.

Claims 31-33 (Canceled).

Claim 34 (Previously Presented): A movement vector generating process according to Claim 30, comprising three or more movement vector generating processes.